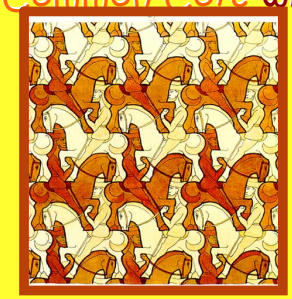
Translations

made with sparklee.com

Check out these other files
Reflections
Rotations
Dilations

Transforming Geometry into the Common Core with Transformations



with an Interactive Notebook foldable

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Jan 18-12:46 AM

Translations

Transformations

Common Core Standards

History and information about transformations

Translations definition, activities, notations,

Using this file

Foldables - student and teacher copies

Table of Contents

Grade 8 Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

- CCSS.Math.Content.8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations:
  - CCSS.Math.Content.8.G.A.1a Lines are taken to lines, and line segments to line segments of the same length.
  - CCSS.Math.Content.8.G.A.1b Angles are taken to angles of the same measure.
  - CCSS.Math.Content.8.G.A.1c Parallel lines are taken to parallel lines.
- CCSS.Math.Content.8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Grade 8 Geometry p.1

Grade 8 Geometry (cont.)

Understand congruence and similarity using physical models, transparencies, or geometry software.

- CCSS.Math.Content.8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- CCSS.Math.Content.8.G.A.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Grade 8 Geometry p.2

High School Geometry

Understand similarity in terms of similarity transformations

- CCSS.Math.Content.HSG-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor:
  - CCSS.Math.Content.HSG-SRT.A.1a A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
  - CCSS.Math.Content.HSG-SRT.A.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

HS Geometry p.1

High School Geometry (Cont.)

Understand similarity in terms of similarity transformations

- CCSS.Math.Content.HSG-SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- CCSS.Math.Content.HSG-SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

HS Geometry p.2

Common Core Math Practices

The CCSSM expects mathematically proficient geometry students to

- experiment,
- explain,
- prove,
- visualize,
- understand,
- derive, and
- translate

between representations.

Students are expected to demonstrate geometric habits of mind, and be proficient in the Standards of Mathematical Practice.

CCSS Math Practices

Transformations


Leonhard Euler (1707-1783)

The first use of transformations dates back to the ancient Greeks around the time of Euclid. However, not until Euler (in 1776) did anyone identify all the kinds of transformations in space that could yield congruent figures.

It is interesting that the 3-dimensional analysis of congruence was accomplished before the 2-dimensional. This is probably because the congruent objects seen daily are 3-dimensional.

History

rotations translations dilations
reflections

A transformation is a correspondence between sets of points such that each point in the image has exactly one preimage point.

Transformation

Why study transformations?

- Studying these various transformations helps a person to become more aware of the movements of objects such as gears (which rotate) and conveyer belts (which slide).
- More complicated movements, such as those done by robots, can be taken apart into their component moves and analyzed.
- Transformations also appear in music and help to show some connections between mathematics and music.
- Things like cartoons, comics, flip books, storyboards, how-to books, and picture instructions use transformations to show motion

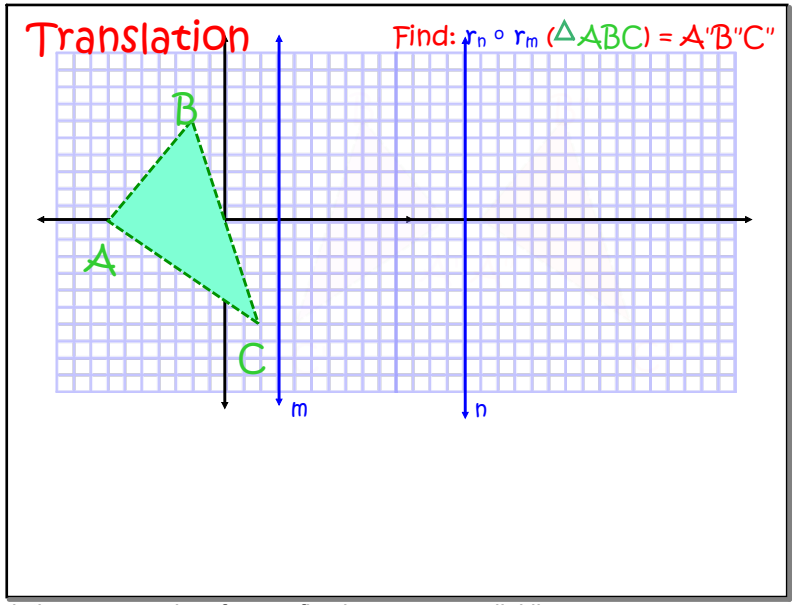
Why Study Transformations?

Definition

Translations definition

Translations as Slides

Translations as slides



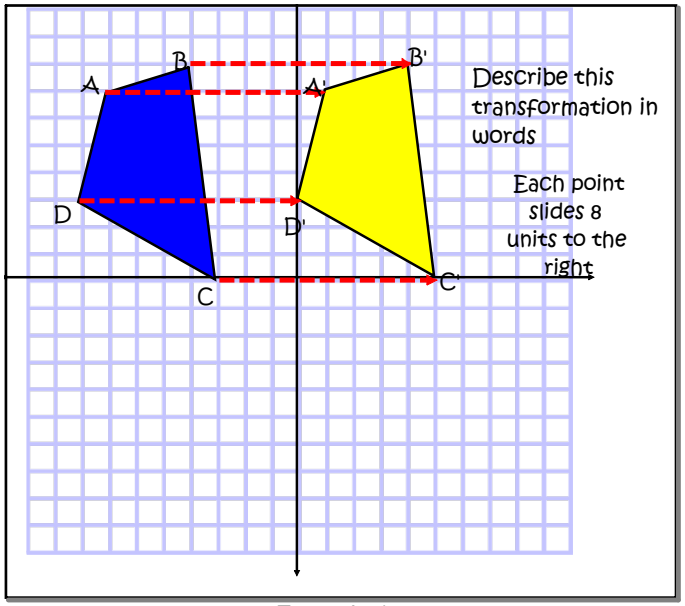
Translation - composite of two reflections over parallel lines

Translations Notation

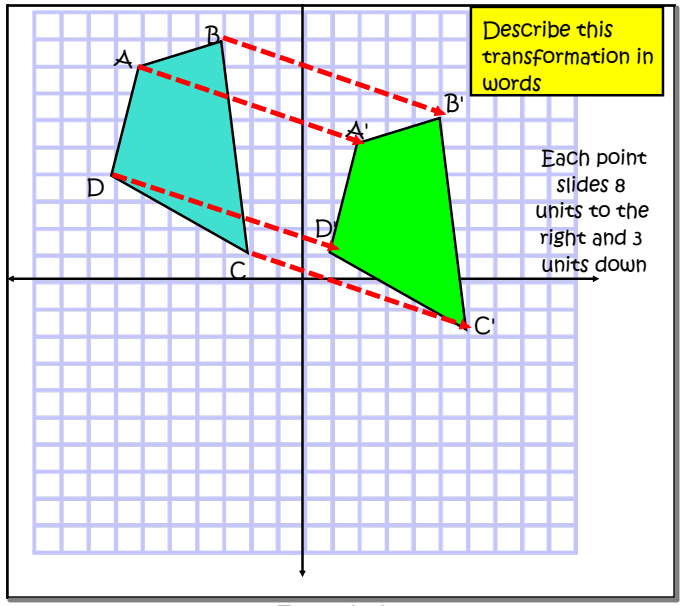
There are several ways to indicate that a translation is to occur:

description 7 units to the left and 3 units down
(This is a verbal description of the translation)

Notation Page 1



Example 1



Example 2

Translations Notation

There are several ways to indicate that a translation is to occur:

description — 7 units to the left and 3 units down
(This is a verbal description of the translation)

mapping — $(x,y) \rightarrow (x-7, y-3)$
(This is read, "the x and y coordinates will be translated into x-7 and y-3")
Notice that adding a negative value (subtraction) moves the image left and or down, while adding a positive value moves the image right and/or up)

Notation Page 2

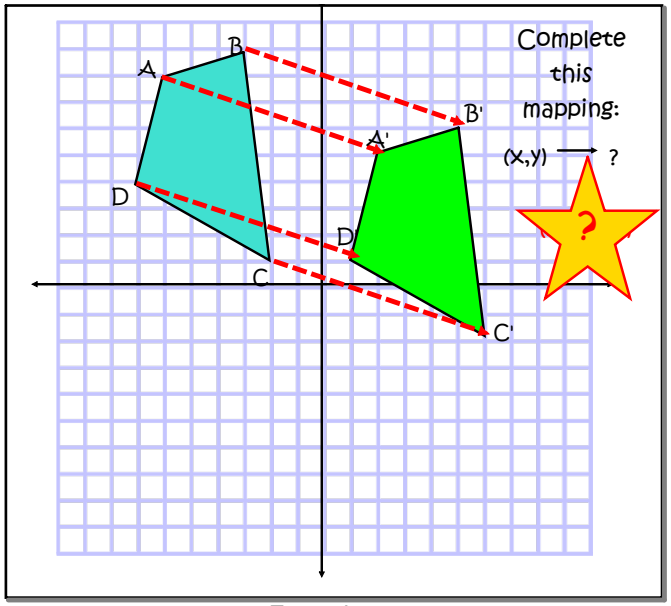
Apply the translation: $(x,y) \rightarrow (x+3, y+2)$

To the point (3,8)

Click on the correct answer:

(-1,3) (5,7) (6,10) (3,2)

Example 3



Example 4

Translations Notation

There are several ways to indicate that a translation is to occur:

description — 7 units to the left and 3 units down
(This is a verbal description of the translation)

mapping — $(x,y) \rightarrow (x-7, y-3)$
(This is read, "the x and y coordinates will be translated into x-7 and y-3")
Notice that adding a negative value (subtraction) moves the image left and or down, while adding a positive value moves the image right and/or up)

notation — $T_{(-7,-3)}$ (The -7 tells you to subtract 7 from all of your x-coordinates, while the -3 tells you to subtract 3 from all of your y-coordinates.)

This call also be written as $T_{-7,-3}(x,y)=(x-7, y-3)$

Notation Page 3

Slide the notation through the arrow to reveal the answer.

$T_{(x-2,\ y+3)}$ (4,5) =

Example 5

Describe the translation that takes the point (-2,5) to (-4,9).

Use the eraser to check your answer.

T(x,y)

Example 6

Translations Notation

There are several ways to indicate that a translation is to occur:

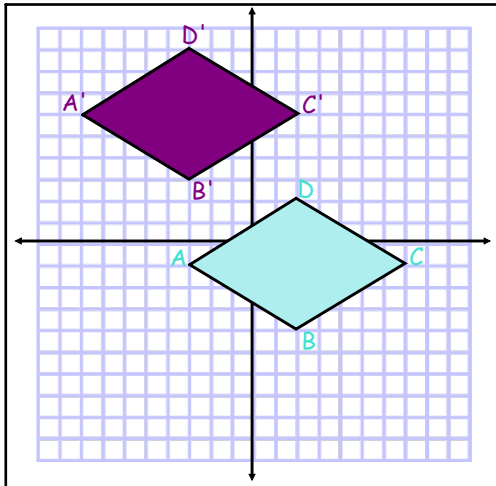
description — 7 units to the left and 3 units down
(This is a verbal description of the translation)

mapping — $(x,y) \rightarrow (x-7,\ y-3)$
(This is read, "the x and y coordinates will be translated into x-7 and y-3")
Notice that adding a negative value (subtraction) moves the image left and or down, while adding a positive value moves the image right and/or up)

notation — $T_{(-7,-3)}$ (The -7 tells you to subtract 7 from all of your x-coordinates, while the -3 tells you to subtract 3 from all of your y-coordinates.)
This call also be written as $T_{-7,-3}(x,y)=(x-7,\ y-3)$

vectors — $\vec{v} = \langle -7,-3 \rangle$
(A vector, a directional line segment, may also be used to shown the movement of a translation.)

Notation Page 4



Draw a vector to show the movement of the translation and complete the vector notation.

$\vec{v}$ = _____

Click here to check your answer

Example 7

Translations Notation summary

description

7 units to the left and 3 units down

(This is a verbal description of the translation)

notation

$T_{(-7,-3)}$ (The -7 tells you to subtract 7 from all of your x-coordinates, while the -3 tells you to subtract 3 from all of your y-coordinates.)

This call also be written as

$T_{-7,-3}(x,y)=(x-7,\ y-3)$

mapping

$(x,y) \rightarrow (x-7,\ y-3)$

(This is read, "the x and y coordinates will be translated into x-7 and y-3")

Notice that adding a negative value (subtraction) moves the image left and or down, while adding a positive value moves the image right and/or up)

vectors

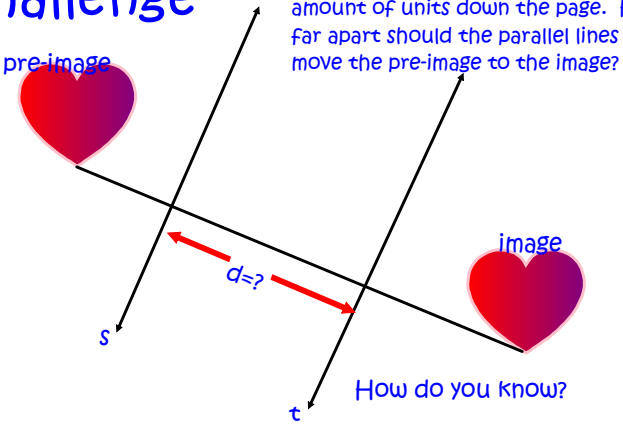
$\vec{v} = \langle -7,-3 \rangle$

(A vector, a directional line segment, may also be used to shown the movement of a translation.)

Notation Summary Page

Challenge

You want to move the heart a given amount of units down the page. How far apart should the parallel lines be to move the pre-image to the image?



How do you know?

Challenge

Did you figure it out?

If m || n, the translation has a magnitude two times the distance between m and n in the direction from m perpendicular to n.

Prove it!

Prove it challenge

Complete your foldable notes

Feb 4-4:15 PM

Translation

Translation

Definition:

Click here

Notation:

Click here

Properties:

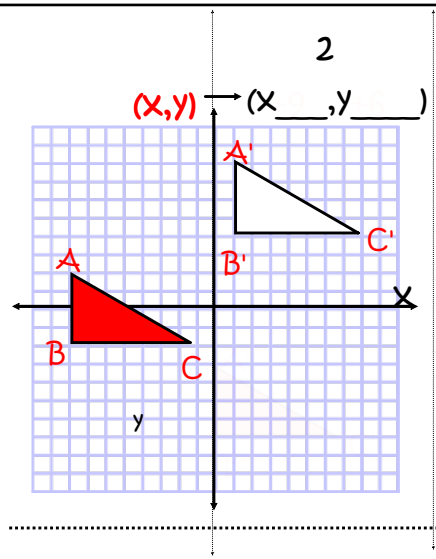
Click here

Translation foldable - page 1

2

(x,y) → (x___,y____)

Finish the notation for this translation

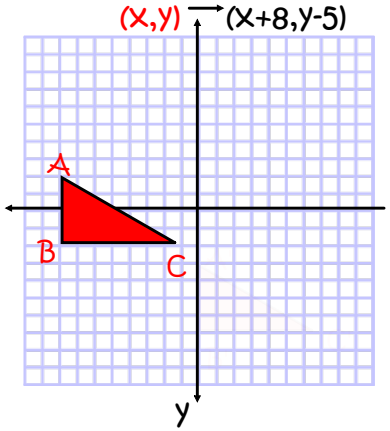


Translation foldable - page 2

Draw this translation

3

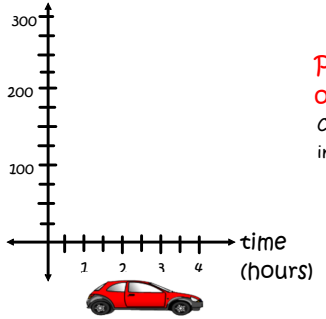
(x,y) → (x+8,y-5)



Translation foldable - part 3

4

distance (miles)



d(t) = 50t +25

Plot the car's position over time

Can you express the car's travel in one hour as a vector?

Translation foldable - part 4

Thank you...

Go forth and TRANSFORM the World!

Resources/References

~~Geometry, 3rd Edition~~ - The University of Chicago School Math Project
by John Benson, Ray Klein, Matthew Miller, Catherine Capuzzi-Feuerstein, Michael Fletcher, George Marino, Nancy Norem Powell, Natalie Jakucyn, and Zalman Usiskin. McGraw Hill/Wright Group, 2009.

Find the handouts, presentations in both SMART Board and .PDF formats at:

~~http://GeometryGems.wikispaces.com/iMathination~~

Thank you

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Resources

Back to the menu

Information

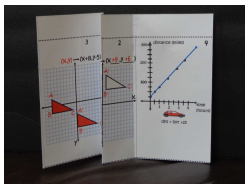
The foldable note sheets are meant to give students a place to summarize their findings and should in no instance substitute for explorations and investigations that will help students understand transformations/translations. Take time to do the activities in this file and add other activities that will enrich students' understanding of transformations/reflections.

A set of foldable student notes and samples of teacher answers are included.

1. There are notes for translations in this file (reflections, rotations, and dilations are available in their files). Each set is two pages. If you are downloading the SMART Notebook file, you can easily edit them.

2. These notes are intended to be printed double sided and printed in color. If you print them, print them landscaped, duplex (double-sided) and make sure they flip on the short edge so the front lines up with the back. If you choose not to print them in color, students can easily add their own color to the notes.

3. The notes should be cut out and folded on the dotted lines. I will add pictures on ~~http://GeometryGems.wikispaces.com/iMathination/~~ to show you what these notes look like when they are folded.



Photos of teacher copies

Foldable instructions

Foldables to put into an interactive notebook

To print these, make sure to read the directions

Foldables

Translation "slide" 1

Translation

Definition:

Notation:

Properties:

Glue Here

Translation-Student page 1

3

(x,y) → (x+8,y-5)

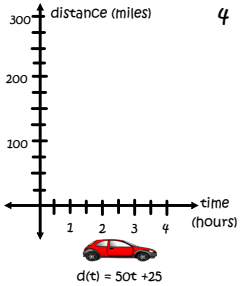
y

2

(x,y) → (x___,y___)

x

4



Translation-Student page 2

Translation

Translation

Definition: A translation is a tranformation of the plane that SLIDEs every point of a figure the same distance in the same direction. It is a composite of two reflections over parallel lines.

Notation:
Given that m ||n, then $r_n \circ r_m (N) = r_n (r_m (N))$ where N is reflected over m and its image is reflected over n
T(a, b) is used for coordinates where (x+a, x+b) is the rule for each translated point.

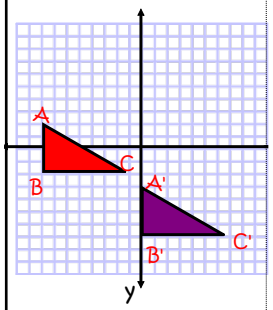
Properties: Translations preserve collinearity, betweenness, distance, and angle measure and have the same orientation.

Glue Here

Translation-Teacher page 1

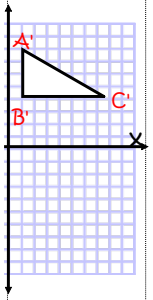
3

(x,y) → (x+8,y-5)

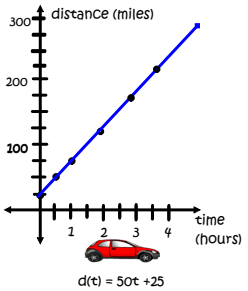


2

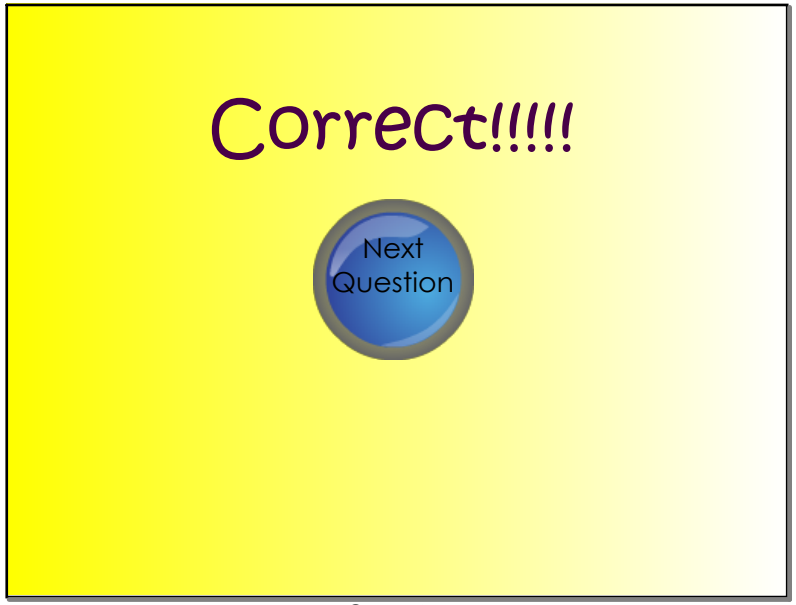
(x,y) → (x +9 ,y +6)



4



Translation-Teacher page 2



Correct

Try Again